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Abstract

Group decision making is often flawed, possibly because individual group members fail to pay attention to and integrate available information into their decision. This paper investigated groupware processes that provided categories for information and that required the receiver of comments to categorize the information. These processes led to increased attention to information and increased integration of information, which in turn led to improved decision quality.

Introduction

Groups seldom exchange all available information that is important to the decision (Stasser and Stewart, 1992; Stasser and Titus, 1985; 1987; Stewart and Stasser, 1995). Even when groups do exchange key information, participants often ignore new information from others and rely instead on their pre-discussion preferences (Dennis, 1996b; Dennis, Hilmer, and Taylor, 1997-98; Gigone and Hastie, 1993). Simply put, individual information processing (i.e., cognition) often fails in decision making groups.

Research Framework

Four previous studies have examined the exchange and use of information in group decision making (Dennis, 1996a; Dennis, 1996b; Dennis, Hilmer, and Taylor, 1997-98; Hightower and Sayeed, 1996). These studies suggests that groupware can significantly improve the exchange of information so that larger groupware-supported groups discuss enough unique information to enable them to make optimal decisions. However, groups in these studies made no better decisions when using groupware than when discussing the information verbally, despite identifying and discussing the critical information omitted from verbal discussions. The conclusion from these studies is that groups members often discount or do not attend to information from other members. Simply put, individual cognition often fails in group settings.

There are many potential causes for the failure of cognition. In order to influence an individual's decision, information must be acquired (i.e., attended to) and evaluated and incorporated into the individual's decision framework (i.e., integrated) (Patton, Giffin, and Patton, 1989; Guzzo, 1982; Gouran, 1982). Thus two possibilities are that individuals do not attend to information they receive, or that if information is attended to, it is not integrated. The goal of this paper is to investigate new groupware techniques that may improve attention to and integration of information.

One must realize that no one approach will be best for all situations, but the goal is to improve the efficiency and effectiveness of decision making using groupware (DeSanctis and Gallupe, 1987). Just as having a structured approach in solving problems helps individual decision making (VanGundy, 1988; Smith, 1973), so too may having a structured approach in groupware help users process information better, leading to better decisions.

Attention to information

If information is received in a format that makes it difficult to process, participants may not exert sufficient cognitive effort to process it (Petty and Cacioppo, 1986). Most groupware differs from verbal discussion in that participants must actively search out and review information -- a "pull" approach that requires more effort on their part. Thus important information may not be attended to. That is, it is unintentionally overlooked because it is more difficult to find and process information when it is presented in a pool of text (Dennis, 1996b).

Instead of having the information displayed in one pool of text, it can instead be displayed in categories based on the decision alternatives. Displaying alternative-based categories may make it easier to attend to because the categories arrange similar pieces of information together (Shiffrin, 1976), which may make it easier to remember (Rosch, 1978). Therefore:

H1: *Groupware processes that display information within categories will increase the attention to information.*

Integration of information

Information received during discussions may be attended to, but may not be processed to the same extent as information received prior to discussions (Gigone and Hastie, 1993). Prior to group discussion, participants have sufficient uninterrupted time to process information, integrate it into their decision framework, and formulate a decision preference. During discussions, however, participants may be unable to process and integrate new factual information as quickly as they need to (Petty and Cacioppo, 1986).

When participants are required to act on information received it may increase integration (Wood, 1982). In this study, one groupware process required participants to categorize information received based on the decision alternatives, while another groupware process required participants to filter information received as either important (still based on the decision alternatives) or not important for their decision. In these group processes, the group members would have to judge every piece of information based on which decision alternative it refers to and on the importance of that bit of information to the decision. Filtering information by importance may focus the individual efforts and enable the information to be better integrated (Pinsonneault and Kraemer, 1989). Therefore:

H2a: *Groupware processes that require the act of categorizing information will increase integration of information.*

H2b: *Groupware processes that enable the filtering of information by importance will increase integration of information.*

Decision quality

Factors that matter in decision quality include the structure imposed on group processes by technological supports and facilitation (Pinsonneault and Kraemer, 1989). Research has shown that adding structure, such as maintaining focus within the group, positively affects decision outcomes (DeSanctis and Gallupe, 1987; Smith, 1973). Keeping more focus of attention should concentrate the group members on the task at hand. The task focus should lead to higher decision quality (Poole, Holmes, Watson, and DeSanctis, 1993; Pinsonneault and Kraemer, 1989). Categorization and filtering of information provides more efficient use of cognitive resources that may result in better decision outcomes (Benbasat and Lim, 1993).

In summary, the use of groupware processes that increase attention to information may make important information less likely to be overlooked and focus attention towards that important information, thereby leading to better decisions. However, increased attention alone may not be sufficient; information must also be integrated. Thus, attention to information coupled with increased integration of information should promote even better decisions. Therefore:

H3a: *Individuals using groupware processes designed to increase attention to information will make better decisions.*

H3b: *Individuals using groupware processes designed to increase integration of information will make better decisions.*

Research Methodology

A lab experiment with a four-treatment design was conducted. A total of 188 undergraduates served as subjects and were asked to make a decision on a student admission task used in prior studies (e.g., Dennis, 1996b) that required subjects to select one student from a set of four for admission to the university. For this study, the facts on the subjects' task sheet (i.e., the information known before the groupware discussion) contained only partial information for the decision problem, leading subjects to a particular, incorrect decision. Data from any subjects that did not initially choose the intended candidate based on the partial information given in the task sheet were discarded prior to analysis.

In order to study the effects of different experimental manipulations on individual group members, a groupware simulator was used. The groupware simulator was implemented to automate a confederate (e.g., Connolly, Jessup, and Valacich, 1990). The rest of the task's information was supplied from the simulator and should lead the subjects to the correct decision for the decision problem. Subjects were asked on a post-study questionnaire whether they thought they had worked with a real or simulated group. The data from all subjects answering simulated group (23%) were discarded prior to analysis.

Each treatment presented the same comments from the simulator at the same time intervals, but the way in which the comments were displayed was different. The first treatment (baseline) provided electronic communication with anonymity and parallelism by containing a list of discussion comments in one window. The second treatment (sender categorize) was similar to the baseline treatment, except that it displayed the comments in four categories based on the decision alternatives and was designed to increase participants' attention to the information, without assisting them to integrate the information. In this treatment, the sender allocated their comments to one of four categories (i.e., the four decision choices). The remaining treatments were designed to increase both attention to and integration of information by requiring subjects to categorize each piece of information as it was received. Instead of categorizing comments when they are sent, the third treatment (receiver categorize) required participants to drag and drop each comment they received into one of the four decision alternative categories. The fourth treatment (filter by importance) required participants to drag and drop each comment they received as "Important" (i.e., into one of the four decision alternative categories) or "Not

Important" (i.e., into an area titled 'not important') to their decision.

Attention to information was assessed in two ways. First, a perceptual measure was used. A post-session questionnaire included a scale designed to measure *perceived attention* to information (7 items, α = .848). Second, attention to information was measured by a recall of information on the post-session questionnaire. Subjects were asked to list all task information they remembered. This was coded as either *known information recalled* (i.e., information given from the task sheet prior to using the simulator) or *learned information recalled* (i.e., information received from the simulator).

Information integration was also assessed in two ways. First, a perceptual measure was used. The post-session questionnaire included a scale designed to measure *perceived integration* of information (8 items, α = .930). In the second measure subjects were asked to indicate which of the task information on the free recall question they used in making their decision. Again, this was coded as either *known information used* (i.e., information from the task prior to using the simulator) or *learned information used* (i.e., information from the simulator script).

Decision quality was coded as a zero-one. Subjects choosing the correct alternative after the group discussion received a one; incorrect, zero.

The experiment began with each subject working individually to make a decision on the task sheet. Then the subjects were told that the task sheet provided only partial information for the decision. The subjects then worked in a "group" to discuss the task and learn new information known only to "other group members." Each subject actually exchanged information with the groupware simulator, and not with the other subjects in the room. Subjects then filled out questionnaires asking them to make another decision, to recall information discussed and used, and to report several perceptions.

Results and Discussion

There were no differences in *perceived attention* among the four treatments ($F(3,182) = 1.21$, p = ns). However, the *learned information recalled* differed among treatments ($F(3,182) = 3.16$, p = .026), but *known information recalled* was not different ($F(3,182) = 1.93$, p = ns). In short, the groupware processes using categories helped focus attention on the new information first seen in the "discussion."

There were significant differences in *perceived integration* among the treatments ($F(3,181) = 3.49$, p = .017). Once again what they integrated more was the new information first received from "others" via the simulator (*learned information used* post-hoc Tukey, α = .05). The treatments had no effect on the information already read, considered, and integrated prior to the "discussion" (*known information used* ($F(3,164) = 2.12$, p = ns)).

There was no improvement in decision quality due to the increased attention to information (*perceived attention* $\chi^2(1,187) = 1.84$, p = ns; *learned information recalled* $\chi^2(1,162) = 2.73$, p = ns; *known information recalled* $\chi^2(1,162) = 1.88$, p = ns), but increased integration of information improved the quality of decisions (*perceived integration* $\chi^2(1,187) = 28.37$, p = .001; *learned information used* $\chi^2(1,162) = 8.03$, p = .005; *known information used* $\chi^2(1,162) = 22.38$, p = .001). Therefore, just looking at comments (i.e., a whole bunch of words) does not lead to good decisions, but evaluation of the comments can.

Conclusion

Previous research showed that some groupware can increase the exchange of information for groups, but that the additional comments do not necessarily lead to better decisions. Lack of individual information processing has been noted as a probable cause. Therefore, this study developed and investigated groupware processes to increase attention to information and integration of information, leading to improved decision quality. Groupware processes that provided categories for information and those that required the receiver of comments to categorize them improved attention to information and integration of information, which led to better decision quality.

The successful use of the groupware simulator has opened the doors to future research. The simulator and its processes have shown new ways for groups to process information and improve decisions using groupware. More research is encouraged to develop additional groupware processes and to investigate this study's processes in other scenarios.

References

References available upon request from first author.